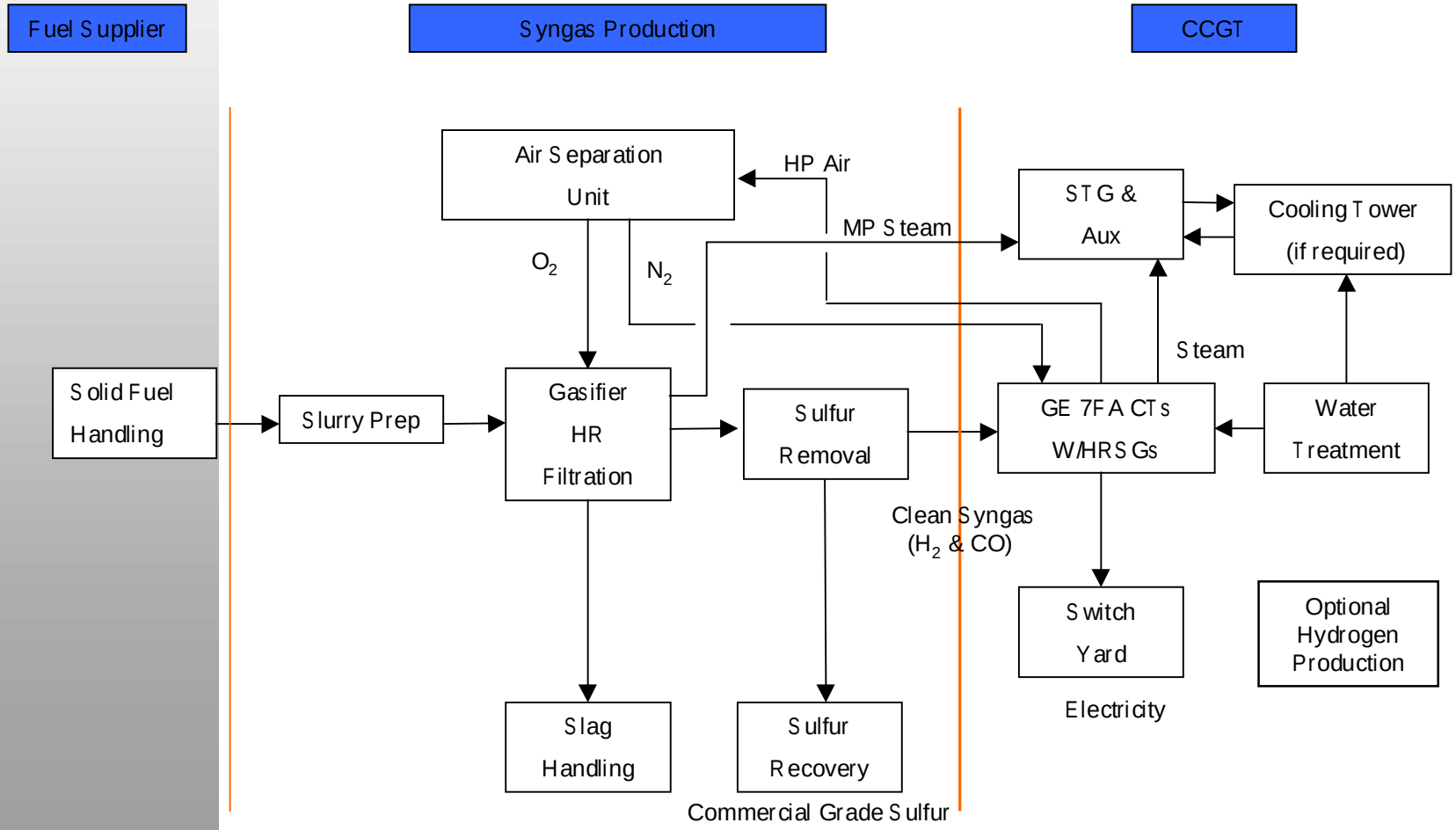
Calpine Fuels Diversity Initiative:

Integrated Gasification Combined Cycle Power Plants

Review of the Basic IGCC Process



Executive Summary

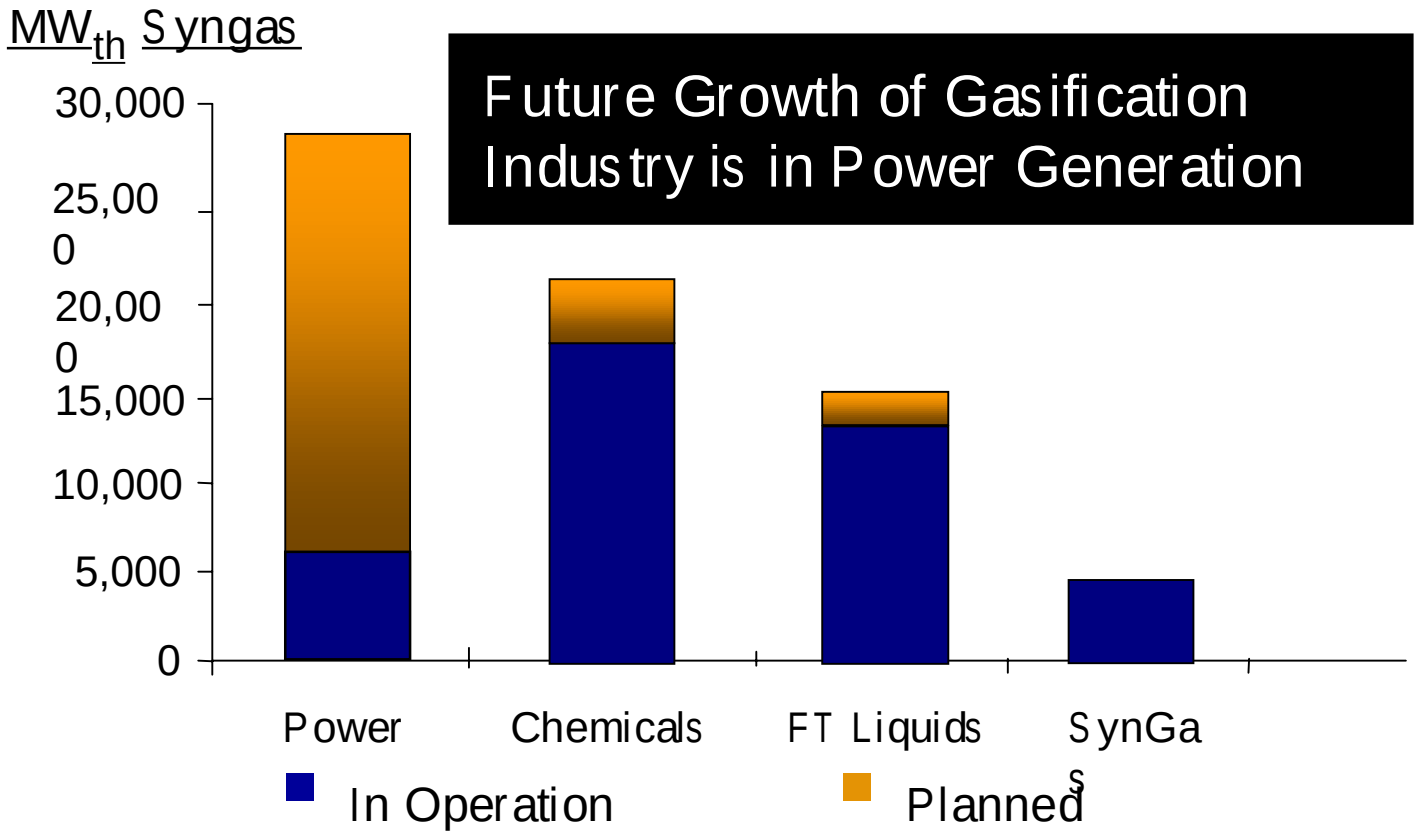
- IGCC Power Plants can compete with those fired on Natural Gas and are a good strategic fit with Calpine's business in a niche market for base load power from coal.
- IGCC Power from coal can be produced for under $40 per MWH (in $2006), structured as a long term tolling agreement.
- Global Energy's gasifier technology, integrated with a Calpine Construct 800 MW, GE 7FA 3x3x1 CCGT plant, can be built for $1200 per kw +/-15% with a heat rate of 8,500 Btu/kWh.
- Proven IGCC Technology has been project financed.

GE IGCC Penetration

Customer	C.O. Date	MW	Application	Gasifier
SCE Cool Water - USA	**1984**	**120**	**Power/Coal**	**Texaco - O_2**
LGTI - USA	1987	160	Cogen/Coal	Destec - O_2
Demkolec - Netherlands	1994	250	Power/Coal	Shell - O_2
PSI/Destec - USA	**1995**	**260**	**Repower/Coal**	**Destec - O_2**
Tampa Electric - USA	**1996**	**260**	**Power/Coal**	**Texaco - O_2**
Texaco El Dorado - USA	**1996**	**40**	**Cogen/Pet Coke**	**Texaco - O_2**
SUV - Czech.	**1996**	**350**	**Cogen/Coal**	**ZUV - O_2**
Schwarze Pumpe - Germany	**1996**	**40**	**Power/Methanol/Lignite**	**Noell - O_2**
Shell Pernis - Netherlands	**1997**	**120**	**Cogen/H_2/Oil**	**Shell - O_2**
Puertollano - Spain	1998	320	Power/Coal/Pet Coke	Prenflow - O_2
Sierra Pacific - USA	**1998**	**100**	**Power/Coal**	**KRW - Air**
ISAB - Italy	1999	500	Power/H_2/Oil	Texaco - O_2
API - Italy	2000	250	Power/H_2/Oil	Texaco - O_2
MOTIVA - Delaware	**2000**	**240**	**Repower/Pet Coke**	**Texaco - O_2**
Sarlux/Enron - Italy	**2000**	**550**	**Cogen/H_2/Oil**	**Texaco - O_2**
EXXON – Singapore	**2000**	**180**	**Cogen/H_2/Oil**	**Texaco - O_2**
Nihon Sekiyu - Japan	2004	350	Power/Oil	Texaco - O_2
Bio Electrica – Italy	**2005**	**12**	**Power/Biomass**	**Lurgi – Air**
ENI-San Nazzaro, Italy	2005	150	Power/Oil Cogen	Shell
IOC Paradip	**2005**	**180**	**Power/Pet Coke**	**Shell O_2**
Global-Kylkima, OH	**2006**	**1000**	**Power/Coal/RDF**	**BGL - O_2**
EDF - Total	**2006**	**400**	**Power/H_2/Cogen/Oil**	**Texaco - O_2**
Texaco/TVA	**2006**	**800**	**Power/Coal**	**Texaco - O_2**
PIEMSA	**2006**	**800**	**Power/H_2/Oil**	**Texaco - O_2**
TPS/Lake Charles	**2006**	**1000**	**Power/H_2/Oil**	**Texaco - O_2**
		8432		

- Projects in operation, under construction or announced
- **Bold: GE Gas Turbines**

Gasification Applications by Market



Source: SFA Pacific for U.S. DOE

The Coal fired IGCC Track Record

- **Small scale, single train coal fired IGCC plants have suffered from high CAPEX and low availability**
  - Installed EPC costs of $1500-2000 per kW
  - Less than 80% availability on coal fuel

	Gasification		Combustion		
Location	Technology	Fuel	Turbine	Net MW	Startup
Buggenum, Holland	Shell	Coal	Siemens V94.2	250	1994
Wabash, Indiana	Global E-Gas	Coke/Coal	GE 7FA	262	1995
Polk County, Florida	Texaco	Coal	GE7FA	250	1996
Puertollano, Spain	Prenflo (Krupp)	Coke/Coal	Siemens V94.3	300	1997

Why IGCC is the Right Coal Technology

- **Electric power industry is looking to IGCC as an environmentally acceptable alternative to oil & coal fired generation technologies.**
  - IGCC industry addressing CAPEX and availability issues.
  - Today's stricter EPA standards are threatening coal plant shutdowns or clean-up, increasing the cost of conventional pulverized coal (PC) and circulating fluidized bed (CFB) coal generation.
  - Uncertainty regarding future emissions standards for CO_2 and Mercury gives IGCC a competitive CAPEX advantage over future PC and CFB coal technology.

Competing Coal Technology Comparisons

Fuel Composition and Site Conditions will Dictate Choice of Technology

700-800 MW Plant in Illinois	CFB – 700MW NET	PC – 720 MW NET	IGCC – 810 MW NET
Unit Size (MW)	3 x 266	1 x 800	1 x 900
Net Plant Output (MW)	700	720	810
Installed EPC Cost ($ per kW)	$1520	$1380	$1300
Heat Rate (Btu/kWh – HHV) Illinois Coal	9,900	9,600	8,500
O&M Cost w/Major Maint ($MM per yr)	$53	$46	$56
Availability	93%	93%	92%
Power Price (2002 $/MWh)	$42.49	$38.17	$36.62
Proposed EPA Limits:			
NO_x 0.016 (lbs per MM Btu)	0.20	0.06	0.036(9 ppm w/o SCR)
SO_x 0.040 (lbs per MM Btu)	0.70	0.22	0.046(98.92%)
PM_{10} 0.006 (lbs per MM Btu)	0.015	0.018	0.01
Hg 0.200 (lbs per MM Btu)	Expensive	Expensive	0.13 (95%)
CO_2 Capture	Expensive	Expensive	Low Cost

* Project Start QI 2002 and COD QIII 2006

Project Finance for IGCCs

- Several IGCC Projects funded by Project Financings in late 1990's before significant operating experience
  - 500 MW ISAB, Italy, COD 1999
  - 220 MW API, Italy, COD 2000
  - 550 MW Sarlux, Italy, COD 2000

- Most Current IGCC Development Projects are structured for Project Financings
  - 800 MW Texaco/TVA, AL
  - 1000 MW TECO, LA

- R.W. Beck has advised Calpine that all three gasifier technologies being considered are bankable…provided we use demonstrated technology.

Why IGCC is Right for Calpine

- Provides **Market Diversity**
- **Coal Tolling Arrangements** mitigate merchant power market risk
- Provides **Fuel Diversity**
- Leverages Calpine's **CCGT Construction and O&M Expertise**

IGCC Market Strategy

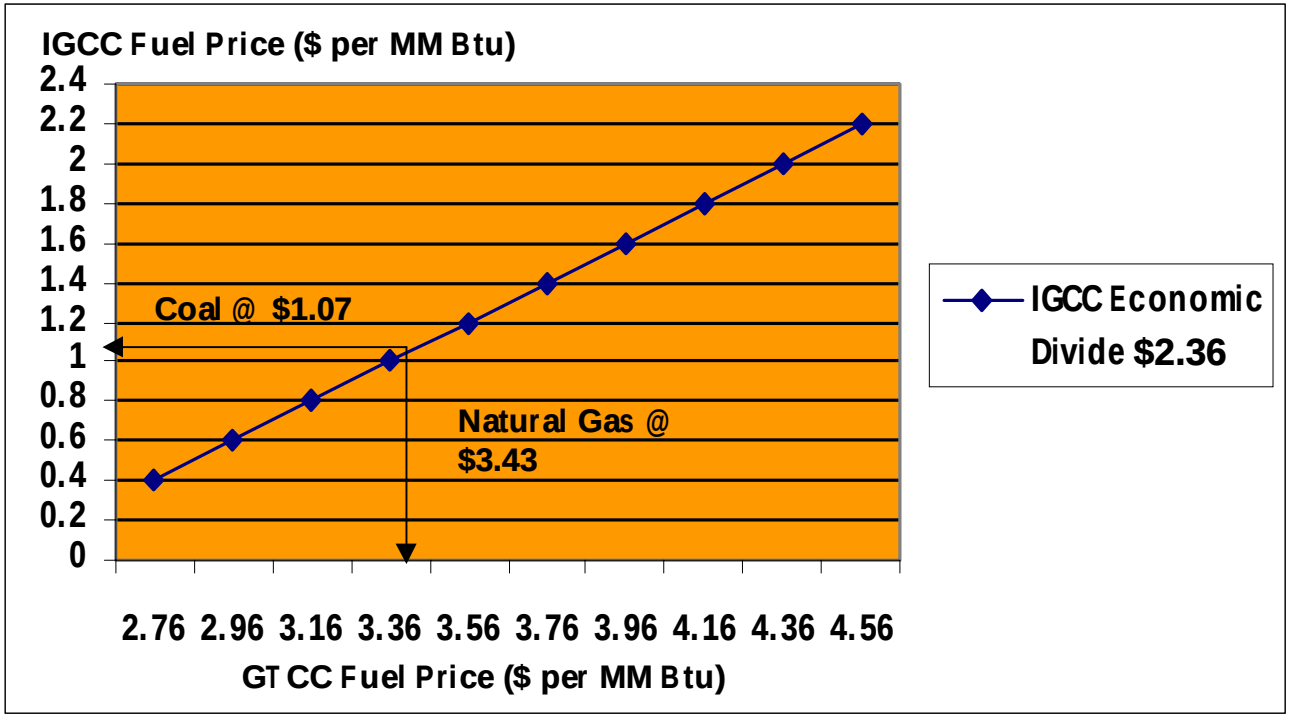
- **Develop large scale 800+ MW projects**
- **Market long term tolling arrangements and/or power off take agreements**
- **Market principally to investor owned utilities and TVA**

Improvements in the IGCC Concept

- **Calpine's IGCC concept addresses the disadvantages in previous coal IGCC projects**
  - 800 MW Scale & Multi-train gasifiers with BOP redundancy
    - 3 train plants can afford spare gasifiers
    - EPC costs of $1100-1400 per kW ($2002)
    - Calpine construct model for CCGT and possibly gasifier.
  - Greater than 95% availability for multi-train gasifiers with one spare:
    - Eastman, Kingsport, TN @ 98% over 15 years.
    - UBE, Japan @ 95% over 15 yrs.
    - Shell Pernis, Netherlands @ 98% over 3 yrs.

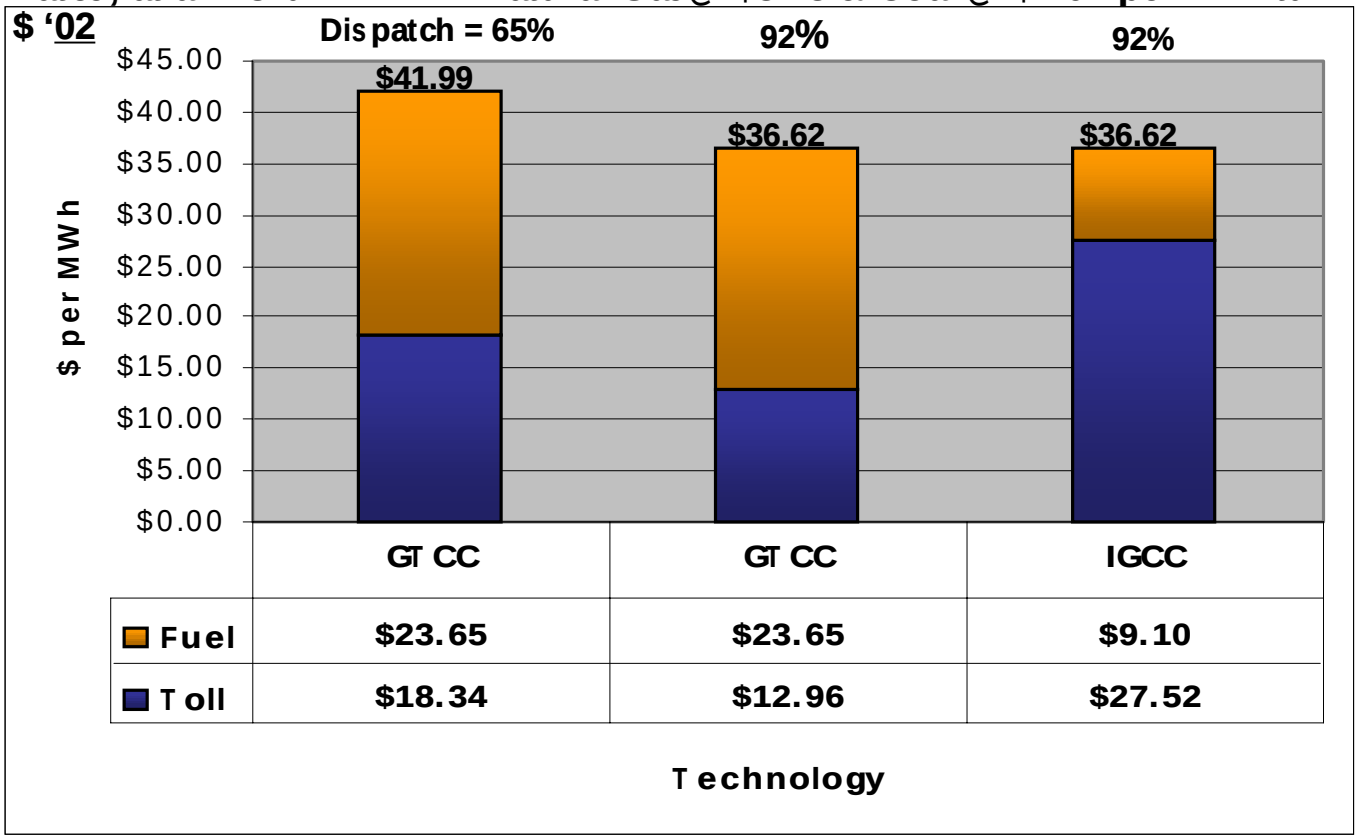
IGCC Produced Power Competes with CCGT

Economics for a design point of 800 MW with a CAPEX of $713/kW GT CC vs. $1617/kW IGCC @ 92% DF



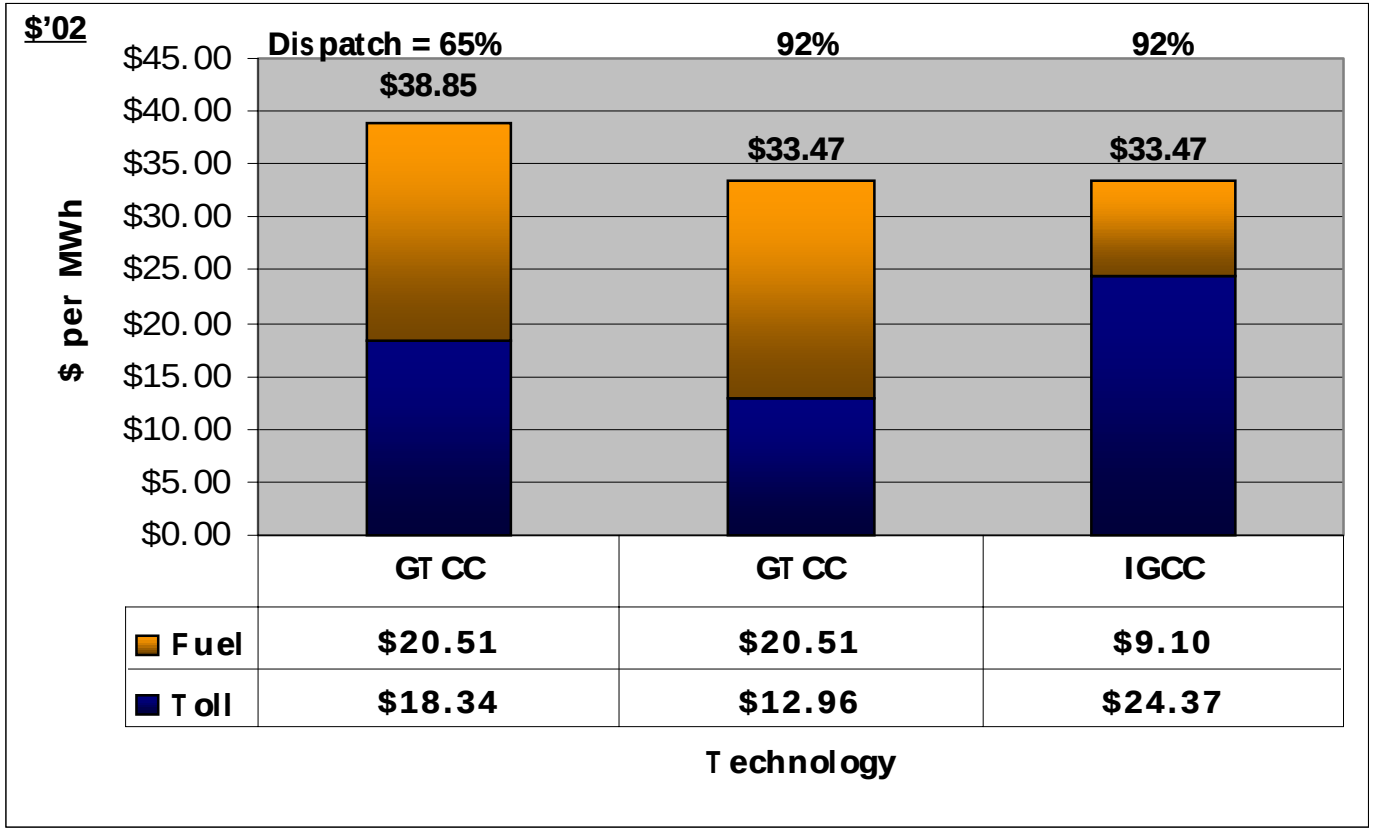
Tolling Rates for the Metropolis 800 MW IGCC Plant compared with an 800 MW, 3 x 1 GE 7FA GT CC Plant

Chart Compares Plants with a 2006 COD at their respective CAPEX and Heat Rates, at an 18% LAT IRR. Natural Gas@ $3.43 & Coal @ $1.07 per MMBtu.



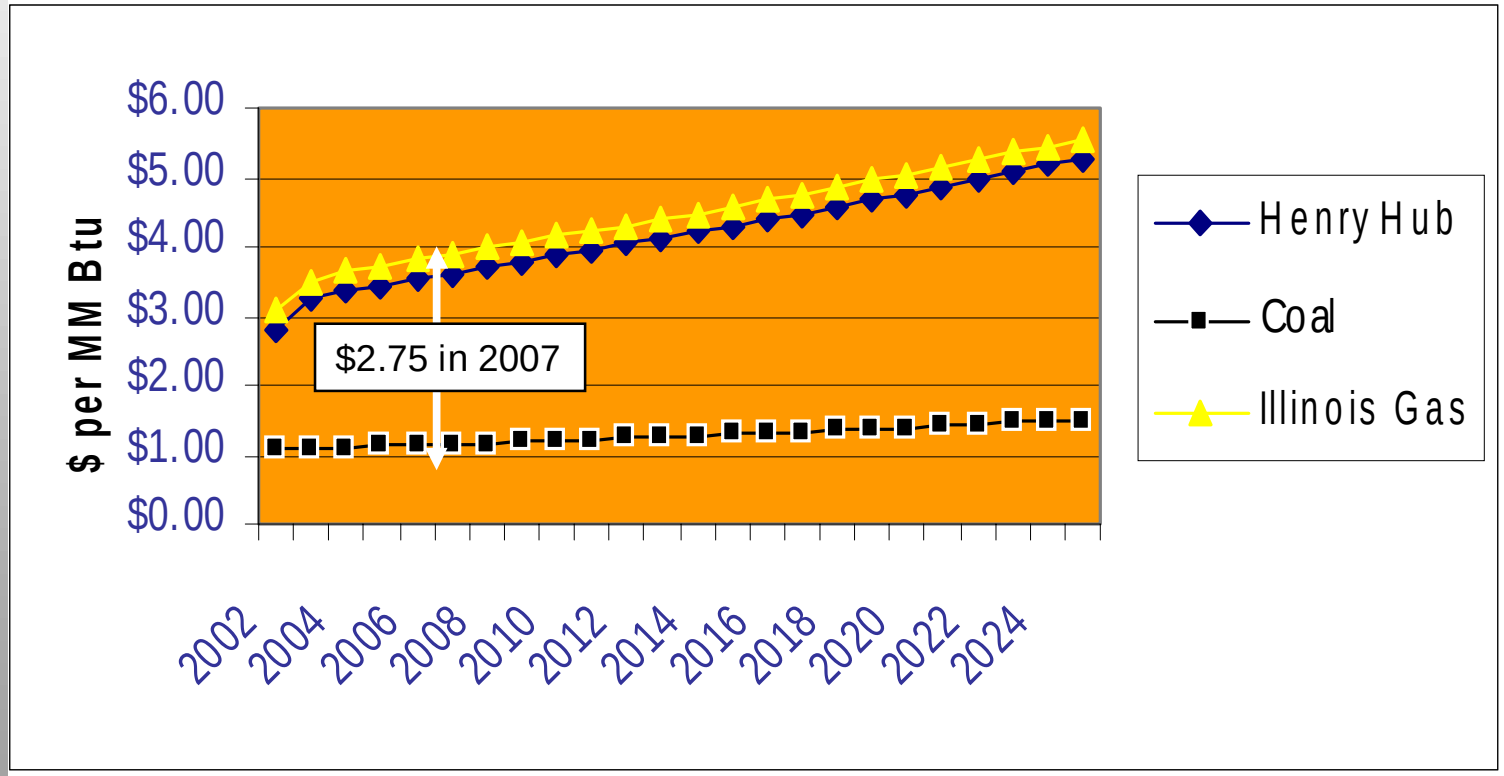
Tolling Rates for Phipps Bend 1600 MW IGCC compared with an 800 MW, 3 x 1 GE 7FA GT CC Plant

Chart Compares Plants with a 2006-7 COD at their respective CAPEX and Heat Rates, at an 18% LAT IRR. Natural Gas @ $2.97 & Coal @ $1.07 per MMBtu.



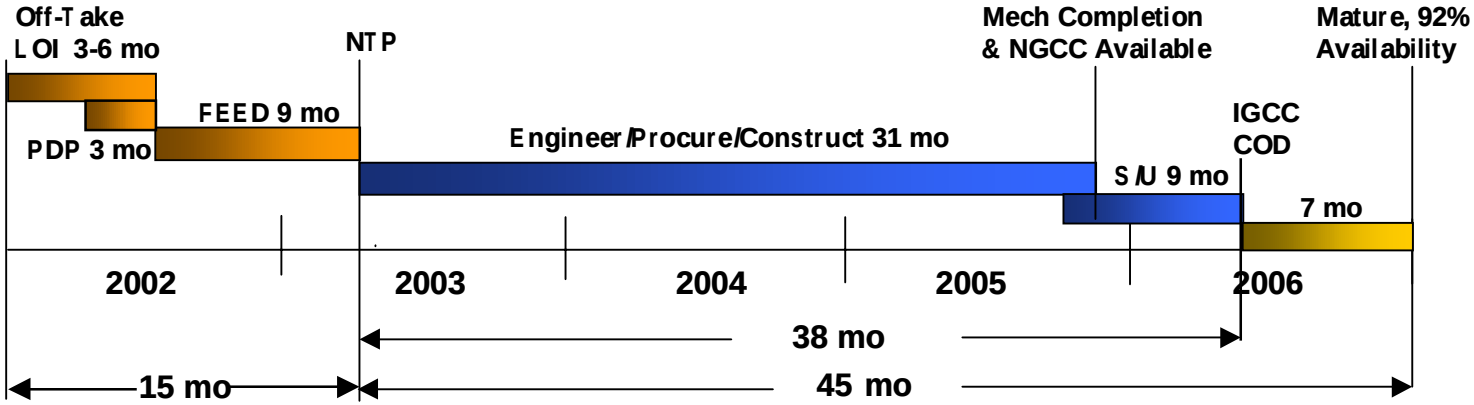
IGCC Produced Syngas can Compete

Natural Gas and Coal Forward Prices



IGCC EPC Considerations

- **The Engineering & Construction Program for an IGCC represents some particular risks and challenges:**



— Longer duration for engineering & construction
— More exposure to labor rate & productivity risk
  - 1.1 MM CCGT Plant Labor man-hours
  - 4.4 MM IGCC Plant Labor man-hours

- **Mitigate Cost and Schedule Risk during FEED**

— Process Design Plan (PDP) defines process requirements
— Front End Engineering & Design (FEED) defines scope, cost & schedule
— Negotiate Major Equipment, EPC and Labor Rates